

Enhanced Two-Phase Heat Transfer

Prof. Chen Li

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Faculty host: Todd Kingston

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Abstract

Two-phase heat transfer plays an essential role in thermal management, water-energy industry, chemical processes, etc. In this presentation, Dr. Li will give a review of his research in two-phase heat transfer conducted in the past decade. In the first part, the topic is how to promote and sustain efficient dropwise condensation (DWC) of steam. It has been challenging to sustain 10 times more efficient DWC in industrial practice compared with the current practice of filmwise condensation due to reliability challenges of coatings. With the development of novel nickel-graphene (Ni-Gr) surface, Dr. Li's team successfully demonstrated DWC in nearly 3 years in an aggressive environment. Fundamental mechanisms have been also revealed. In the second part, Dr. Li will briefly review his series work in enhancing and managing intrinsically stochastic and highly transitional flow boiling in microchannels by successfully regulating two-phase flow patterns. Through various approaches, chaotic flow boiling can be well regulated to achieve significantly more stable two-phase flow and more importantly, drastically enhanced flow boiling performances. More information of his research can be found in his research website <http://www.me.sc.edu/Research/MNT/>.

Dr. Chen Li is a full professor in the Department of Mechanical Engineering at the University of South Carolina (USC), Columbia. He joined ME department at USC as an assistant professor in 2009. He received Ph. D. degree in Mechanical Engineering from Rensselaer Polytechnic Institute (RPI), Troy, NY, in August 2006. He has received couple of prestigious awards such as the SC State Governor's Young Researcher Award for Excellence in Scientific Research, Breakthrough Star of USC, Research Progress Award of College of Engineering and Computing (CEC) at USC in 2017; the ASME ICNMM 2016 Outstanding Early Career Award; and the Young Investigator Research Award of CEC at USC in 2014. His group published more than 70 journal articles in journals of Advanced Materials, Science Bulletin, Nano-Energy, Carbon, Small, Droplet, Int. J. of HMT, etc. Dr. Li's research focuses on two-phase heat transfer such as boiling and condensation. His research has been supported by DOD/ONR, NSF, International Space Station National Laboratory, DOD/DARPA, NASA, EPRI, and DOE/ORNL.

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.

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